

## Site Need Statement

<b>General Reference Information</b>	
1 *	<b>Need Title:</b> Erosion Testing
2 *	<b>Need Code:</b> RL-WT098
3 *	<p><b>Need Summary:</b> The vitrification plant and waste treatment plant will move large volumes of liquid waste during a projected 40-year work life. Many of the liquid wastes will have suspended particles. Not only particles from waste but also glass formers that are recycled inside the plant will be moved. Very little is known about the abrasion of these particles on the various metal parts (pump impellers, piping, protruding instrument wells, etc.).</p> <p>This fiscal year there is to be an erosion study at Savannah River Technical Center to study the effects on erosion on the ultrafiltration step in the waste treatment plant. This test has a planned 2000-hour (~83 day) duration. This test is to demonstrate the erosion resistance in the ultrafilter and LAW evaporator systems that have very high velocities (up to 15 ft/sec) and will be conducted for a duration of ~90-days. Some previous testing has been conducted to measure the Miller Number (a measure of abrasiveness of a slurry) for some simulated wastes. There have been limited measurements of Miller number in the past on actual waste and additional measurements will be needed.</p> <p>The waste abrasiveness as measured by the Miller and SAR numbers needs to be correlated with simulants to assure the simulants are adequate. Other parts of the plant will transfer waste at slower velocities (~ 7 ft/sec). Extrapolating erosion rates to these lower velocities accurately needs to be considered. These tests need to be correlated to actual plant experience at West Valley and at Savannah River.</p>
4 *	<b>Origination Date:</b> FY 2001 (November 8, 2000)
5 *	<b>Need Type:</b> Technology
6	<b>Operation Office:</b> Office of River Protection (ORP)
7	<b>Geographic Site Name:</b> Hanford Site
8 *	<b>Project:</b> Waste Treatment and Immobilization Plant Office of River Protection - Treat Waste Balance of Mission <b>PBS No:</b> ORRPL-TW076
9 *	<b>National Priority:</b> 1. <u>High</u> - Critical to the success of the EM program, and a solution is required to achieve the current planned cost and schedule. 2. <u>Medium</u> - Provides substantial benefit to EM program projects (e.g., moderate to high life-cycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays). X 3. <u>Low</u> - Provides opportunities for significant, but lower cost savings or risk reduction, may reduce the uncertainty in EM program project success.
10	<b>Operations Office Priority:</b>
<b>Problem Description Information</b>	
11	<b>Operations Office Program Description:</b> To perform the activities necessary to remediate the Hanford tank waste, DOE assigned responsibility to the Office of River Protection (ORP) in Richland, Washington. DOE is has extended a contract for the design, construction, and commissioning of a new Waste Treatment and Immobilization Plant (WTP) that will treat and immobilize the waste for ultimate disposal. The WTP is comprised of four major elements, pretreatment, LAW immobilization, HLW immobilization, and balance of plant facilities. ORP is scheduled to award the contract in January 2001.
12	<b>Need/Problem Description:</b> Current testing plans for approximately 2000 hours in a flow loop. The erosion information will then be used to extroplate to a plant that has at least a 40-year design life. An erosion rate that is too small to measure in a 200-hour test mav still be too large for a 40-vearthe plant. A

	longer-term erosion test is needed to confirm the initial erosion rate.
13	<b>Functional Performance Requirements:</b>
14	<b>Definition of Solution:</b> Acceptable solutions will be achieved when calculations and testing of waste simulants demonstrates the expected piping and equipment erosion rates for the projected 40-year operating period design life for of the RPP-WTP.
15 *	<b>Targeted Focus Area:</b> Tanks Focus Area
16	<b>Potential Benefits:</b> The major benefit of these facilities is to ensure that the WTP starts up and operates according to plan and schedule: processing the various wastes in the quantities expected
17 *	<b>Potential Cost Savings:</b> Hundreds of millions of dollars.
18 *	<b>Potential Cost Savings Narrative:</b> With the WTP annual operating cost expected to be in the hundred's of millions of dollars, minimizing plant start up or down time will be a key potential savings, easily measured in the tens of millions of dollars. Additionally, plant process equipment and piping will cost hundreds of millions of dollars to replace if the design basis is incorrect and equipment fails prematurely due to erosion.
	<b>Technical Basis:</b> While the design life of the initial plant is 40 years, only relatively short term testing is planned. There is uncertainty in extrapolating these tests to the a 40-year WTP design life. Longer-term erosion testing is needed to confirm the initial erosion rate.
19	<b>Cultural/Stakeholder Basis:</b> The River Protection Project is committed to moving forward to design, construct, and put into operation the Waste Treatment and Immobilization Plant on the schedule recently agreed to in the Tri-Party Agreement. A robust program is necessary to ensure that delays, all of which are costly, are minimized. A key part of this risk mitigation is to include in the total program, a capability to test the processes and equipment planned with actual wastes. the processes and equipment planned, or later in use.
20	<b>Environment, Safety, and Health Basis:</b>
21	<b>Regulatory Drivers:</b> Environmental Impact Statement (EIS) for the Tank Waste Remediation System (TWRS) (DOE-RL and Ecology 1996) and the Hanford Federal Facility Agreement and Consent Order (known as the Tri-Party Agreement) and its amendments. DOE has negotiated additions to the Tri-Party Agreement that require the retrieval of single shell tanks by 2018, and the startup and operation of the WTP to support the treatment and immobilization of tank waste. By operating the WTP not only is that capability demonstrated and about 10% by volume (25% by activity) of the tank waste processed, but space is made available in the double shell tanks to allow the single shell tank retrieval to proceed without the expenditure of vast sums for additional double shell tanks. Other regulatory drivers include gathering the data necessary for the regulatory permits required for the startup and operation of the facility.
22 *	<b>Milestones:</b> November 15, 1999 triTri-Pparty agreement on principal regulatory commitments: <ul style="list-style-type: none"> <li>• Start (Hot) commissioning-Phase I Treatment Complex 12/2007</li> <li>• Start Commercial Operation-Phase 1 Treatment Complex 12/2009</li> <li>• Complete Phase I-Treatment (no less than 10% of the tank waste by volume and 25% of the tank waste by activity) 12/2018</li> </ul> Other selected TPA milestones are:Retrieve all SSTs 2018 <ul style="list-style-type: none"> <li>• Close SSTs 2024</li> <li>• Immobilize remaining tank waste 2028</li> <li>• Close all tanks 2032</li> </ul>
23 *	<b>Material Streams:</b> ID-3857 HLW to Treatment Risk Score: 3Hanford High-Level Defense Waste. The River Protection Project (formerly known as the Tank Waste Remediation System) involves PBSs RL TW-01 through TW-09. The technical, work scope definition, and intersite dependency risks for Phase 1 Waste Treatment and Immobilization is respectively, 3,3,3 on a scale of 1 to 5 where "5" represents high programmatic risk. This stream is on the critical closure path for Hanford Site cleanup.
24	<b>TSD System:</b> Hanford Waste Treatment and Immobilization Plant. Technical risk is timely startup of this plant and its ability to operate at planned throughput (capacity and operating efficiency).

25	<b>Major Contaminants:</b> Fission products, actinides, nitrate
26	<b>Contaminated Media:</b> Tank waste consisting of supernate (liquid), salt cake, and sludge
27	<b>Volume/Size of Contaminated Media:</b> The Hanford Site has 177 underground tanks that store 204 million liters (54 M gallons) of waste containing about 190 MCi of activity.
28 *	<b>Earliest Date Required:</b> 11/2002 The earliest date required is immediately to support the TPA milestone for Part B Permit Application for Phase I Treatment Complex.
29 *	<b>Latest Date Required:</b> Support the procurement of major plant equipment and piping, which is anticipated to be in fiscal year 2003.
<b>Baseline Technology Information</b>	
30	<b>Baseline Technology/Process:</b>  Technology Insertion Point(s): (as applicable)
31	<b>Life-Cycle Cost Using Baseline:</b> The current baseline for the WTP is several billion dollars, with the BNI estimate itself is in the \$4 billion range. The current River Protection Project life cycle costs are estimated at approximately \$50 billion. The current baseline for the WTP is several billion dollars, with the BNFL estimate over \$20 billion. The current River Protection Project (formerly known as Tank Waste Remediation Systems) life cycle costs are estimated at approximately \$50 billion.
32	<b>Uncertainty on Baseline Life-Cycle Cost:</b> There is large uncertainty in the WTP life-cycle cost, providing the opportunity to reduce the life-cycle cost due to operation improvements as well as ensuring operational success not to add additional cost to the system. Currently there is large uncertainty in the WTP life-cycle cost, and it will be revised after the new Design and Construction contractor is put under contract early in FY2001.
33	<b>Completion Date Using Baseline:</b> Plant operations will be completed between 2028 and 2040. Currently there is large uncertainty in the WTP life-cycle cost, and it will be revised after the new Design and Construction contractor is put under contract early in FY2001.
<b>Points of Contact (POC)</b>	
34	<b>Contractor End User POCs:</b> J.O. (Jim) Honeyman, CH2M Hill Hanford Group, Inc. Tank Waste Treatment Operations; 509-376-7402; F/509-372-1397; email: <a href="mailto:James_O_Honeyman@rl.gov">James_O_Honeyman@rl.gov</a> M.E. (Michael) Johnson, CH2M Hill Hanford Group, Inc. Tank Waste Treatment Operations Research & Technology, 509-372-3628, F/509-376-1788, <a href="mailto:Michael_E_Johnson@rl.gov">Michael_E_Johnson@rl.gov</a>
35	<b>DOE End User POCs:</b> R.(Rudy) Carreon, DOE-ORP, 509-373-7771, F/509-373-0628, <a href="mailto:Rodolfo_Rudy_Carreon@rl.gov">Rodolfo_Rudy_Carreon@rl.gov</a> E.J. (Joe) Cruz, DOE-ORP, 509-372-2606, F/509-373-1313, <a href="mailto:E_J_Cruz@rl.gov">E_J_Cruz@rl.gov</a> B.M. (Billie) Mauss, DOE-ORP, 509-373-5113, F/509-372-2781, <a href="mailto:Billie_M_Mauss@rl.gov">Billie_M_Mauss@rl.gov</a>
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\*Element of a Site Need Statement appearing in IPABS-IS